

## A SYNOPSIS OF AUSTRALIAN ACARINA.

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(Figs. 33—37).

Mr. Nathan Banks, the well-known American Arachnologist, has recently published a valuable, if brief, "Treatise on Acarina, or Mites."<sup>1</sup> The work is rendered the more acceptable to the student of Acarology, from the fact that it gives not only a key to the numerous families and genera, but also a sketch of the life-histories of many species, some of which are of world-wide distribution.

Notwithstanding the fact that the Acarina "have always attracted," as Banks points out in his preface, "considerable interest, both from their minute size and because of the remarkable habits of many species," comparatively little is known about them systematically. Many species have been described from time to time, by a number of authors, but, to again quote Banks "few have really studied them." The literature dealing with the subject is very scattered, and much of it unsatisfactory.

The most reliable workers have been Michael in England, whose masterly monographs of "British Oribatidæ"<sup>2</sup> and "British Tyroglyphidæ"<sup>3</sup> have appeared at different times; and among continental students, Neumann, whose "Revision de la Famille des Ixodidés"<sup>4</sup> is a valuable production, and must take its place as a standard work. Other European acarologists of repute are Trouessart, Kramer, Canestrini, Nalepa and Berlese. The writings of these workers are spread over many publications. It is interesting to note that more species have been described of late years—principally by Trouessart and Canestrini—from New Guinea, than from Australia.

Nearly all parasitic Acarids follow the distribution of their hosts, and so frequently become widely diffused, but a few non-parasitic forms are common in widely separated regions. Most of the latter, as well as some phytophagous species, distribute themselves naturally. There are a number of non-parasitic mites

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<sup>1</sup> Banks—Proc. U. States Nat. Mus., xxviii., 1904, pp. 1-114.

<sup>2</sup> Michael—British Oribatidæ, Ray Soc., 1884 and 1888.

<sup>3</sup> Michael—British Tyroglyphidæ, *loc. cit.*, 1901.

<sup>4</sup> Neumann—Mém. Soc. Zool. France, ix., 1905, pp. 1-44; *ibid.*, x., 1897, pp. 324-420; *ibid.*, xii., 1898, pp. 107-294; *ibid.*, xiv., 1901, pp. 249-372.

which have developed a remarkable nymphal form, termed technically *Hypopus*. This nymph has a number of tiny sucking discs on the ventral surface at the posterior extremity, which enables it to adhere to some other animal, and so be carried from place to place, until it finds a suitable locality. Extreme cold or excessive moisture has little effect upon the species. Some species are of myrmecophagus habits, and these are of very restricted range.

In respect of geographical distribution, many of the species of this order are almost, if not quite, world-wide. This is only natural, seeing that some of these animals are parasitic on man, domestic animals—both great and small—and economic and ornamental plants. Admitting this, it follows, therefore, that the study of the Acarina is of paramount importance, and hence worthy of careful and systematic study. Many terrestrial animals in their wild state—mammals, birds, reptiles, insects, as well as fresh-water and pelagic forms, have Acarid parasites, some of which are harmful and some beneficial; others are parasites upon parasites. Again, some Acarina, so far as we are at present able to judge, have no economic importance whatever.

The life of an Acarid may be divided into four distinct stages: the egg, larva, nymph and adult. The greater majority of Acarians are oviparous; a few are vivi-, or ovo-viviparous, and those of one genus, *Pediculoides*, Targioni-Tozzetti, are recorded as bringing forth adult males and females. One species of this genus, *P. alastoris*, Frogg., occurs near Sydney.

Banks summarises the general plan of development as follows: "The egg is usually deposited by the female. Often within this egg, while the embryo is developing, an inner membrane is formed which encloses the young mite; this stage is the 'deutovum.' The outer shell may be cracked so as to show this membrane, or it may be wholly discarded. The larva at birth has but six legs. It feeds for a while, then passes into a resting stage which in time discloses the eight-legged nymph. The added pair of legs is the fourth, at least usually. During the nymphal period the mite may moult one or more times and change its appearance, but is always destitute of true genital orifices. At the end of the nymphal stage it passes again into a quiescent condition, and in due time moults into the adult mite. During these resting stages much of the internal anatomy of the mite may undergo histolysis, each new stage being rebuilt from the disintegrated tissues of the preceding stage. The genital organs are, however, not effected by these histolytic processes."<sup>5</sup>

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<sup>5</sup> Banks—Proc. U. States Nat. Mus., xxviii., 1904, pp. 7-8.

Upon the question of natural enemies, Banks points out that most mites have few enemies beyond their predatory relatives, but, "there are, however, various cases of protective resemblance, especially among the immature forms. No examples of mimicry, I think, are known."

The Acarina is a very extensive order of the class Arachnida, and many of the species comprising it are remarkable for their minuteness and diversity of form, as well as their marvellous life-histories. A great number of the parasitic species have become, as some writers have shown, distinctly modified in organisation; and owing to this, and the fact that their affinities with the typical Arachnida are so masked by degeneration, it has been urged that it would be more convenient and natural to assign them to an order by themselves. Against this, it is contended that most of the free-living (non-parasitic) species have departed least from the typical Arachnid form, and that they display many affinities to the Solpugids and Phalangids. The majority of Aracologists, therefore, regard this group as a branch of the true Arachnida.

It is difficult to draw up a table of characters sufficiently comprehensive to include the whole group, but the following summary may be of service:

*Cephalothorax and Abdomen.*—These segments are united, the fusion being so complete that in many species they are welded into one mass; in some forms however, they are distinct. The body is often provided with hairs and bristles.

*Eyes.*—Often wanting. When present they are simple; there are usually two pairs, each of which are placed close to the outer angle; more rarely there is only a median pair.

*Mouth.*—Adapted for sucking; mandibles partially united, and form with a plate (*epistome*) and the *labium* a beak, known as the *rostrum* or *capitulum*, the latter often separated from the cephalothorax by a membranous joint; mandibles formed for piercing, sometimes provided with a pair of "nippers" at the tip, and sometimes simply pointed.

*Legs.*—Commonly eight in the adult form, and six in the larval. The Eriophyidæ, however, are unique in that there are never more than four in either adult or larva. In *Pteroptus*, Dufour (Gamassidæ), there are eight, both in larva and adult. The legs are arranged in pairs, two of which are seated well forward, and two behind; the latter apparently arise from the abdomen, but as Banks remarks, this is probably not the case; it is "rather that the coalescence of the abdomen and cephalo-

thorax has effaced the true outlines of these portions." The embryonic forms of *Gamasus*, Latr., and *Ixodes*, Latr., have four pairs of legs before birth, but one pair is aborted to be again developed at the nymphal stage. This Banks regards as an indication that the six-legged larva is a secondary development, and lessens the apparent difference between Acarina and other Arachnids. In *Uropoda*, Latr., the anterior legs are inserted in the *camerostome*—the opening of the body into which the mouth parts are inserted.

*Abdomen*.—Usually large and devoid of segmentation; in some, however, segmentation is distinct. The *corpus vulva* or *epigynum* is of various shapes and sometimes closed by flaps; male aperture (*epiandrium*) usually smaller than that of the female. The reproductive system is often highly developed, and frequently occupies a considerable part of the body.

*Respiratory Organs*.—For the purpose of respiration many species are endowed with an elaborate tracheal system, but there are a large number of forms not provided with such. Amongst those species in which a tracheal system obtains, great variations are displayed. Commonly the tracheæ open near the mandibles, but with the Ixodidæ and Gamasidæ the apertures are near the hind legs. In some species the tracheal openings occur in the coxal cavities (*acetabula*). Of those—and the species are many—which have no tracheal system, it has been observed that the skin is soft, and that oxygen is absorbed by osmosis through the general surface of the body.

The object of the present paper is primarily to draw the attention of Australian students to our rich and extensive Acarid fauna. To this end a list of the known species—endemic and introduced—together with those families which may reasonably be expected to occur, is given below. Species apparently new are described.

Banks divided the larger groups of the order into eight superfamilies,<sup>6</sup> which he defined as follows:—

1. Abdomen annulate, prolonged behind; very minute forms; often with but four legs. . . . . *Demodicoidea*.
- Abdomen not annulate nor prolonged behind; always with eight legs. . . . . 2.
2. With a distinct spiracle upon a stigmal plate on each side of body (usually below) above the third or

<sup>6</sup> Banks—Proc. U. States Nat. Mus., xxviii., 1904, p. 10.

- fourth coxæ or a little behind; palpi free; skin often coriaceous or leathery; tarsi often with a sucker. . . . . 3
- No such distinct spiracle in a stigmal plate on this part of body. . . . . 4.
3. Hyperstome large, furnished below with many recurved teeth; venter with furrows; skin leathery; large forms, usually parasitic. . . . . *Ixodoidea*
- Hyperstome small, without teeth; venter without furrows; body often with coriaceous shields, posterior margin never crenulate; no eyes. *Gamasoidea*.
4. Body usually coriaceous, with few hairs; with a specialised seta arising from a pore near each posterior corner of the cephalothorax; no eyes; mouth parts and palpi very small; ventral openings of abdomen large; never parasitic; tarsi never with a sucker. *Oribatoidea*.
- Body softer, without such specialised seta. . . . . 5.
5. Living in water. . . . . *Hydrachnoidea*.
- Not living in water . . . . . 6.
6. Palpi small, three-jointed, adhering for some distance to the lip; ventral suckers at genital opening or near anal opening usually present; no eyes; tarsi often end in suckers; beneath the skin on the venter are seen rod-like epimera that support the legs; body often entire; adult frequently parasitic. . . . *Sarcoptoidea*.
- Palpi usually of four or five joints, free: rarely with ventral suckers near genital or anal openings; eyes often present; tarsi never end in suckers; body usually divided into cephalothorax and abdomen; rod-like epimera rarely visible; adults rarely parasitic. 7.
7. Last joint of palpi never forms a "thumb" to the preceding joint; palpi simple, or rarely formed to hold prey; body with few hairs. . . . *Eupodoidea*.
- Last joint of palpi forms a "thumb" to the preceding, which ends in a claw (a few exceptions); body often with many hairs. . . . *Tromboidea*.

*Super-family* EUPODOIDEA.*Family* EUPODIDÆ.

No Acarids of this family have up to the present been described from Australia, but one species at least occurs. The family is a small one, and the individuals comprising it microscopic. All are predacious, and feed upon small insects or insect's eggs; one or two species are supposed to be parasitic. They are soft-bodied, delicate, with moderately long to long legs; the division of the cephalothorax and abdomen is more or less clearly defined; the cephalothorax is usually provided with two eyes—one on each side; the abdomen is provided with a few simple hairs; palpi are short, simple, four-jointed, and furnished with a few hairs; mandibles chelate, and (except in the genus *Rhagidia*, Thor.) small; legs six or seven jointed, terminating with two simple claws, and often with a median plumose pulvillus. These Acarids are fond of cold, damp places; most of the species occur upon the ground, where they may be found lurking amidst fallen leaves: some occur upon the foliage of trees.

*Genus* EREYNETES, Berl.

## ERYNETES LIMACUM, Schr.

*Erynetes limacum*, Schr., Ins. Aust., 1781, p. 521.

*Acarus limacum*, Schr., loc. cit.

*Hab.*—Australia (introduced); Cosmopolitan.

*Host.*—Common European slug, *Limax maximus*, Linn. This species has followed its host in distribution. Slugs may often be seen with numbers of this Acarid swarming over them. In 1890 my colleague, Mr. C. Hedley, recorded<sup>7</sup> an Acarid as parasitic on *L. maximus* and *F. flavus*, Linn. It was doubtless the species here listed.

*Super-family* TROMBIDOIDÆ.*Family* CHEYLETIDÆ.

This is a small family, and the species constituting it are microscopic. None have, so far, been recorded from Australia, but as some are parasitic on animals that have been introduced here, it is quite likely that they may yet be recorded when the

<sup>7</sup> Hedley—Proc. Linn. Soc. N.S. Wales, v., (2), 1890, p. 892.

group shall have been systematically worked out. Banks points out that they differ considerably in habits and structure among themselves. Some are predacious, and some parasitic; a few occur upon some animals to prey upon the parasites of the host. The existence of parthenogenesis has been recorded in respect of several of the Cheyletidae. Banks states that "in one genus *Sarcopterus*, there is no anus; the food of this mite is of such a nature as to be completely digested."<sup>8</sup> The animals upon which Cheyletidae occur are the house and field mouse, several birds, and bats. Some live in cavities or little cells beneath the skin and hair follicles. The eggs, singly or in clusters, are attached to the hairs of the respective hosts, and some species secure their ova by spinning a small web over them.

The Cheyletidae are distinguished by their long beak and enormous palpi; the latter may be three or five-jointed; in some species each palpus is furnished with a minute movable tubercle or papilla near the tip on the inner side, and this is occasionally tipped with one or two pectinate bristles; the beak is separated from the body by a deep constriction; the body is usually oval, the skin soft, occasionally with chitinous plates, which in some species are finely striated; a few hairs are always present, sometimes in the form of scales; division between cephalothorax and abdomen usually wanting; legs generally short, five-jointed, usually armed with two claws, between which there is a bunch of hairs or a pectinate bristle. In some species the front legs terminate in bristles, which appear, according to Banks to have a tactile function; in others the front legs are transformed into clasping organs; sometimes two eyes are present—one on each side of the cephalothorax, but they are not often distinct; mandibles invariably long and needle-like, and fitted for piercing tissues; in one genus these organs are provided with two points.

#### *Family* TETRANYCHIDÆ.

The Tetranychidae are popularly known as "Red Spiders" and are familiar enough to most horticulturists; or are sometimes termed "spinning mites," from the fact that some of the species spin fine silken threads. Some of the species have followed their host plants, and hence have become widely distributed, indeed cosmopolitan. In the present imperfect state of our knowledge it is impossible to say how many species occur in Australia, but several have certainly been introduced. In addition to these there is little doubt but that some native

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<sup>8</sup> Banks—*Loc. cit.*, p. 18.

species also exist. These Acarids have an oval or elliptical body with a few usually long hairs arranged in rows; the body is divided into two parts—cephalothorax and abdomen, and these are separated from each other by a transverse furrow; the cephalothorax has on each side one or two simple eyes. The palpi are short and terminate with a claw, the latter being thumb-like and bearing one or more appendages known as “fingers.” The mandibles have their basal joints united in a plate; the apical joint is long and flexible, and admirably adapted for piercing vegetable tissues, it is known as the stylet. Legs moderately slender, furnished with scattered hairs, and armed with one or two claws. In some species of the genus *Tetranychus* the claw is divided into four pieces; the body is elliptical, being one and a half times as long as broad; the first pair of legs is longer than the body.

*Genus*: BRYOBIA, Koch, = PETROBIA, Murray.

BRYOBIA PRÆTIOSA, Koch.

*Bryobia pratiosa* et *gloriosa*, Koch, Uebersicht des Arachnidensystems, 1837.

.. *speciosa*, Koch, *loc. cit.*, 1838, p. 61.

.. *nobilis*, Koch, *loc. cit.*, 1838, p. 61.

*Petrobia speciosa*, Murray, Eeon. Ent., London (no d.), p. 118.

*Bryobia speciosa*, Crawf., Rep. on the Fusicladiums, &c., Adelaide, 1886, p. 49, pl. iv., f. 20, *a, b, c, d, e*.

.. *ribis*, Thomas, Mt. Thur. Bot. Ver., vi., 1894, p. 10.

.. *speciosa*, Tyron, Ins. and Fungus Pests, Brisbane, 1889, p. 92.

.. *pratiosa*, Oudm., Tigds. Voor Ent., xliiii., 1900, p. 138

*Host Plants*.—Peach trees, almonds, *Arum maculatum*.

*Hab.*—South Australia (introduced): Europe.

BRYOBIA, *sp*

*Bryobia, sp.*, Tryon, Ins. and Fungus Pests, Brisbane, 1889, p. 92

*Host Plants*.—Peach trees and grape vines.

*Hab.*—Queensland.



*Obs.*—Tryon considers this form distinct from Koch's species as determined by Crawford, and although he describes it, refrains from giving it a specific name.

*Genus* TETRANYCHUS, *Duf.*

TETRANYCHUS TELARIUS, *Linn.*

*Tetranychus telarius*, Linn., Syst. Nat., x., 1758, p. 616.

*Acarus telarius*, Linn., *loc. cit.*, p. 616.

*Tetranychus telarius* (Linn.), Oliff, N. S. Wales Agric. Gaz., ii., 1891, p. 778.

*Tetranychus telarius* (Linn.), French, Journ. Agric. Vict., iv., 1906, p. 125.

*Host Plants.*—Pear, plum, cherry, roses.

*Obs.*—This pest has been frequently referred to for many years past in our public press. Doubtless several species have been confused.

*Hab.*—Albury, Cootamundra, Temora; Australia (introduced), widely distributed; Cosmopolitan.

TETRANYCHUS TELARIUS, *var. CINNABARINUS*, *Boisd.*

*Tetranychus telarius*, *var. cinnabarinus*, Boisd., Ent. Hort., 1868, p. 88.

*Hab.*—Australia (introduced).

*Obs.*—This form is peculiar to plants in conservatories. It was originally recorded as parasitic on *Dracæna australis*. Boisduval states that when it hatches from the egg "it is then green or yellowish-green; later it is variegated with black and green; after its last change of skin, it becomes a beautiful aurora red in colour. . . . It carpets the underside of the *Dracæna* with threads of silk on which it walks like a spider. It does a great deal of harm to the leaves that it sucks, stopping their vegetation and causing them to become diseased. It is not difficult to destroy them; to do so it is sufficient to place them in a cold house during two or three days."

*Hab.*—Australia (introduced).

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<sup>9</sup> French—Journ. Agric. Vict., iv., 1906, p. 125.

TETRANYCHUS CUCUMERIS, *Boisd*

*Tetranychus cucumeris*, Boisd., Ent. Hort. 1868, p. 84

*Obs.*—Peculiar to cucumber and gherkin, but other plants are also attacked by it. It is very minute. When the Cucurbitaceæ are attacked, the weak and sickly plants should be removed.

*Hab.*—Australia (introduced).

TETRANYCHUS ROSARUM, *Boisd*

*Tetranychus rosarum*, Boisd., Ent. Hort., 1868, p. 83

*Host Plants.*—The host plant of this species is the rose, on the underside of the leaves of which it is sometimes found. This is probably the species determined by French as parasitic on roses in Victoria.

*Hab.*—Australia (introduced).

*Obs.*—Several other genera are included in this family and are probably represented in Australia, but in a preliminary study, and from lack of material systematically collected, it is impossible to define them.

## Family RHYNCHOLOPHIDÆ

These mites are usually bright red, and one of our species, at any rate, is exceedingly common on bushes around Sydney. Only one species, *Smaridia extranea*, L. Koch, has hitherto been recorded from Australia, but two additional species, each apparently referable to the genus *Ryncholophus*, Dug., are described below. One of these is common enough around Sydney, but the other is from the 6000 feet level of Mount Kosciusko, where it was collected by my colleague, Mr. C. Hedley, in January last. The other form, collected by Dr. E. P. Ramsay, appears equally as abundant in winter as in summer. Both forms were taken from plants.

In the Ryncholophidæ the body is usually divided into two parts, but the division is not very distinct. Along the middle of the cephalothorax there is a longitudinal furrow known as the dorsal groove or *crista*. It is usually enlarged at the anterior and posterior extremities, and sometimes at the middle. In the two Australian genera known to me there are two simple eyes on each side of the cephalothorax, but in the genus *Smaris*, Latr., two additional eyes have been recorded, and these are placed close together near the middle of the anterior margin.

Banks reports these animals as being usually found on the ground, sometimes in very hot situations, and that they run over the surface or on low plants with great rapidity. Dr. Ramsay tells me that those collected by him were always fairly active. Some individuals occur in moss or under fallen leaves. Those collected by Ramsay congregate together in larger or smaller groups, whilst the form collected by my colleague on Mount Kosciusko was solitary. Nothing is known of the habits of our indigenous species, but they will doubtless be very similar to those of their exotic congeners. Banks tells us that the eggs are deposited on the ground or under stones, often in clusters. The larva is a six-legged mite attached to insects, and when fully-fed drop to the ground, become quiescent, and after a varying time transform to the adult. One American species has been found preying on a scale insect (*Aspidiotus*): others upon the San Jose scale, and sometimes *Aphis lions* (*Chrysopa*).

*Genus SMARIDIA, Latr.*

*SMARIDIA EXTRANEA, L. Koch.*

*Smaridia extranea*, L. Koch, Verh. Zool. Bot. Ges. Wien, xvii., 1867, p. 242.

*Hab.*—Queensland.

*Genus RHYNCHOLOPHIUS, Latr.*

*RHYNCHOLOPHUS MONTANUS, sp. nov.*

(Fig. 33).

Scarlet; somewhat shield-shaped; above, the animal is densely clothed with rather short bristles and hairs; junction of cephalothorax and abdomen ill-defined. *Crista*.—Full length of thorax, enlarged a little in front of posterior extremity, where there is also a small tubercle present. *Eyes*.—Four, sessile, arranged in pairs, one on each side of cephalothorax. Under-side free from bristles, but densely hairy. *Genital Opening*.—Between hind coxæ; distinct. *Legs*.—Rather short, seven-jointed, fourth pair longest; all densely clothed with long hairs. Length of body 3 mm., width 1·8 mm.

*Host Plants*.—Bushes (C. Hedley).

*Hab.*—Mount Kosciusko, at 6000 feet.

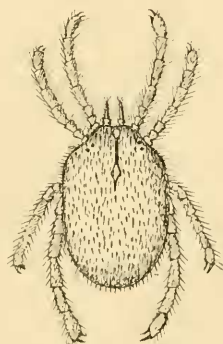


Fig. 33.

*R. montanus*, Rainb.

RHYNCHOLOPHUS CELERIPES, *sp. nov.*

(Fig. 34).

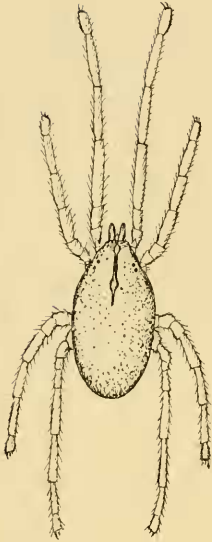


Fig. 34.

*R. celeripes*, Rainb.

Scarlet, elliptical; above, the animal is densely pilose; junction of cephalothorax and abdomen indistinct. *Crista*.—Full length of cephalothorax, deep, broadest at anterior and posterior extremities; at each extremity there is a small tubercle, and in front of the anterior one a tuft of long bristles proceeds. *Eyes*.—Four, sessile, arranged in pairs, one on each side of cephalothorax. Underside similar in colour and clothing to dorsal surface. *Genital Opening*.—Between hind coxæ, distinct. *Anal Opening*.—Below the latter, distinct. *Legs*.—Exceedingly long, seven-jointed, clothed with fine hairs and bristles, but not nearly so densely as in *R. montanus*. Length of body, 3·8 mm., width 1·8 mm.

*Host Plants*.—Bushes (E. P. Ramsay).*Hab*.—Enfield, at all seasons of the year.

## Family TROMBIDIIDÆ

This is a family of considerable extent, and includes a large number of genera. The family is an ancient one. Gourret has described two forms from the Tertiaries at Aix, France, namely, *Megameropsis aquensis* and *Pseudopachynathus maculatus*. Several species of Trombidiidæ have been recorded from New Guinea and islands close at hand, but only one from Australia. It is quite obvious, though, that others must occur, and when systematic collection has been effected it will probably be found that this branch of our native fauna will be fairly extensive.

Popularly these Acarids are known as "Harvest Mites" in the United States. The body is divided into two parts, the first of which, the cephalothorax, carries the first and second pairs of legs and the abdomen the third and fourth pairs. Banks points

out<sup>10</sup> that these mites differ from Rhyncholophidae in that the last joint of leg iv. is not or very slightly shorter than the penultimate, and also that the last joint of leg iv. is not swollen. In leg i. the last joint is usually swollen, often more so than in species of the family last quoted. They are also red in colour, though some species are darker than others; the body is clothed with bristles or feathered hairs according to the species. The palpi are five-jointed, prominent, often swollen at the middle, the penultimate joint ending in one or two claws, the last joint appearing as an appendage or "thumb" to the one preceding. Legs seven-jointed and clothed similarly to the body; tarsi terminating with two small claws. The cephalothorax has a *crista* running down the middle, and this is enlarged at the centre or posterior extremity into a triangular space known as the *areola* in which are two pores from which arise bristles. Two eyes are placed on each side of the cephalothorax, and these are frequently elevated upon long pedicels.

In the larval form, these Acarids are parasitic, and are found at times on beetles, butterflies, moths, flies, mosquitoes. Mr. G. A. Waterhouse, B.Sc., has taken the *Leptus* (or larval form) of a Trombidium from butterflies collected by him on Mt. Kosciusko. Mr. G. Goldfinch has also collected forms of *Leptus* from the common house-fly. The mature Trombidiidae feed on insects—plant lice, caterpillars and the like. In the United States one species, *Trombidium locustarum*, Riley, destroys numbers of grasshopper eggs, and in France a species has been recorded as destroying the root forms of *Phylloxera*, that scourge of the vine.

In Europe, Japan and America, the larval forms of Trombidiidae, when numerous, are sometimes known to attack man, causing intense irritation and pain, and have even been known to promote serious complications. In the United States they are known, when found upon man as "Red Bug." These larval mites burrow beneath the skin and produce inflamed spots. As Banks points out, "this is an unnatural position for the mites, and they soon die, but the waiting is not pleasant. In France these pests are known as *rouget* or *aoûtat*, and are the cause of *Erythema autumnale*; in Germany they produce *Stachelbeerkrantheit*. In England they are called "Harvest Mites" or "Gooseberry Bugs"; in Mexico, *Talsahuate*; Japan, *Akamushi*; and the West Indies, *Bête-rouge*.

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<sup>10</sup> Banks—*Loc. cit.*, p. 30.

*Genus* TROMBIDIUM, *Fabr.*TROMBIDIUM SERICATUM, *sp. nov.*

(Fig. 35).

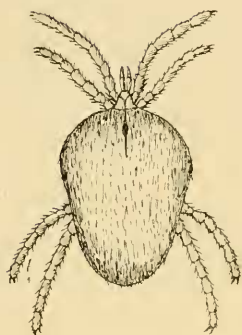


Fig. 35.

*T. sericatum*, Rainb.

abdominal extremity. Length of body 4·5 mm., breadth 2·3 mm.

*Hab.*—Gisborne, Victoria (Mr. Geo. Lyell). Mr. A. R. McCulloch, of the Australian Museum collected specimens at Wyangarie, New South Wales.

TROMBIDIUM PAPUANUM, *Canest.*

*Trombidium papuanum*, Canest., Atti. Ist. Venet., (6), ii., 1884, p. 718, pl. iv., fig. 5.

*Host.*—"On an Australian Longicorn."

*Hab.*—Australia.

LEPTUS (*larvæ*).

*Host.*—Butterflies (Mr. G. A. Waterhouse, B.Sc.).

*Hab.*—Mt. Kosciusko, at 6000 feet.

LEPTUS (*larvæ*).

*Host.*—House-fly (Mr. G. Goldfinch).

*Hab.*—Mosman, Sydney.

LEPTUS (*larvæ*).

*Host.*—Day-flying Moth—*Procris viridipulverulenta*, Guér. (the writer).

*Hab.*—Sydney

*Obs.*—Mr. Goldfinch has also observed a *Leptus* on a moth, *Sericea spectans*, Gn.

## Super-family HYDRACHNOIDEA.

## Family HYDRACHNIDÆ.

In this family only one species, *Hydrachna odontognathus*, Canest., has been recorded from Australia, and two more are now added—*Eylais maccullochi* and *Atax cumberlandensis*. The family is extensive and widely distributed, and the species occur not only in fresh and brackish water, but also in the sea. All are free-swimming as a rule in the adult stage, but in the larval state they are parasitic. In the Hydrachnidae, the integument is entire, there being no division between the cephalic and thoracic regions, and the body is more or less convex, spherical or broadly ovate. In some genera, as in *Arrenurus*, Dugés, the male has an elongated abdomen tipped with a median projection called the *petiolus*. In the genus *Eylais* there are four simple eyes situate close together on a plate near the median line, whilst in *Atax*, Fabr., there are only two, and these are widely separated. The integument is soft, and the animals are either scarlet or bluish-green; according to Banks, some American species are prettily marked with yellow and black, and vary considerably in maculation. The mouth-parts are often hidden under the anterior margin of the cephalothorax, and the *maxillary palpi*, consisting of four or five joints, varies so much, that it is of great value to the systematist in classification. The legs are usually of equal length, although it is not uncommon to find the first pair somewhat the longest; normally they are seven-jointed, and clothed with long hairs which aid them in swimming; in this respect the third and fourth pairs are much more densely hairy than the others.

*Genus* EYLAIS, Latr.

= *Eulais*, Piersig and Lohmann.

EYLAIS MACCULLOCHI, *sp. nov.*

(Fig. 36).

Scarlet, elliptical, strongly arched, integument smooth; mouth-parts hidden under anterior margin of cephalothorax. *Body.*—

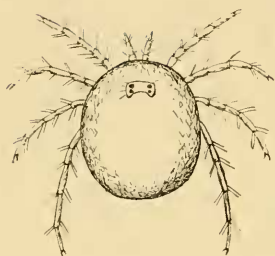


Fig. 36.

*E. maccullochi*, Rainb.

—Four, united to the venter. Length of body 3.5 mm., breadth 2.7 mm.; some specimens rather smaller.

*Hab.*—Parramatta, June, 1905, in ponds.

*Obs.*—I have named this species in honour of Mr. A. R. McCulloch, of the Australian Museum, who at my request and some personal inconvenience to himself, collected this and other material for me.

*Genus* HYDRACHNA, Mull.

HYDRACHNA ODONTOGNATHUS, Canest.

*Hydrachna odontognathus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 719.

*Host.*—A water beetle.

*Hab.*—Australia.

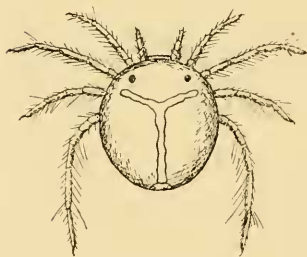


Fig. 37.

*A. cumberlandensis*, Rainb.

Entire, there being no division between the thoracic and abdominal segments. *Maxillary Palpi.*—Five-jointed, hairy. *Eyes.*—Four, simple, close together upon an eye-plate, arranged in pairs, one eye in front of the other. *Genital Opening.*—Midway between the posterior coxæ. *Legs.*—Arising close together on anterior part of venter, and in a radiate arrangement; they are not strong, but are of moderate length, and are provided with swimming hairs: the fourth pair is somewhat the longest. *Coxal or Epimeral Plates.*

*Genus* ATAX, Fab.

ATAX CUMBERLANDENSIS, *sp. nov.*

(Fig. 37).

Body bluish-green; legs green; elliptical, strongly arched, mouth-parts hidden under anterior margin of cephalothorax. *Maxillary Palpi.*—Enlarged at base, fourth joint bearing three spurs below. *Eyes.*—Two, simple, widely apart. *Body.*—Entire, integument smooth with a finely impressed median longitudinal mark, wavy in out-



line, running down the abdomen: this has two lateral branches at its anterior extremity. On the underside the colour is a little lighter than above. *Genital Opening*.—Near posterior extremity. *Sucking Discs*.—On each side, twelve. *Legs*.—Not strong, rather long; fourth pair somewhat the longest; all provided with swimming hairs. *Coxal or Epimeral Plates*.—Three, united to the venter. Length of body 1.9 mm., breadth 1.2 mm.

*Hab.*—Parramatta, in ponds, June, 1905 (Mr. A. R. McCulloch).

*Obs.*—Species of the Molluscan genus *Diplodon*, Spix, occur in fresh-water ponds around Parramatta, and they are frequently infested with Acarids. The latter, however, are scarcely parasitic, as they feed on minute animals drawn in by the mollusc.

#### Family HALACARIDÆ

Several species of Halacaridæ have been recorded from Australia and adjacent islands, and as all of these are pelagic, it is only natural to expect such forms (or at any rate, some of them) to have a wide geographical range. Those occurring on the shores of New Guinea and the North Island of New Zealand, for instance, may certainly be expected to occur here. These Acarids are minute, ranging from one to two millimetres in length. They are found upon Algae, Corals, Crustaceans and Chitons, often in shallow water, although some have been dredged at considerable depths. Halacarids have a tough skin, which may be striated or granulated, and most frequently destitute of hairs or bristles. The body is usually clearly divided into two parts, and the cephalothorax has usually three eye-spots—one on each side and one at the middle in front. Legs are moderately long, rather widely separated at the base, and lateral or sub-lateral in origin. Each tarsus terminates with two claws. Some Halacaridæ occur in fresh water, and some in brackish.

#### Genus AGAUE, Lohm

##### AGAUE BREVIPALPUS, Troues.

*Agauë brevipalpus*, Troues., Naturaliste, xi., 1889, p. 181; Bull. Sci. France Belgique, xx., 1889, p. 247; Lohmann in Ergeb. Plankton Exped., ii., 1893, p. 87; Trouessart, Bull. Soc. Zool. France, xxv., 1900, p. 47.

*Hosts*.—Algae and Corals

*Hab.*—Pacific Ocean, Sydney, New South Wales; also Mediterranean Sea; Atlantic Ocean; Azores, Canaries, Bermudas, Brazil.

## Genus HALACARUS, Gosse

## HALACARUS (POLYMELA) HISPIDUS, Lohm

*Halacarus (Polymela) hispidus*, Lohm., Ergeb. Plankton Exped., ii., 1893, p. 71, pl. iii., f. 7, 9-11.

*Host.*—Algæ.

*Hab.*—Pacific Ocean, Sydney.

## HALACARUS (POLYMELA) PANOPÆ, Lohm

*Halacarus (Polymela) panopæ*, Lohm., Ergeb. Plankton Exped., ii., 1893, p. 72, pl. iii., f. 1, 8, pl. iv., f. 8, 9.

*Host.*—Algæ

*Hab.*—Pacific Ocean, Sydney ; Atlantic Ocean, Cape Verd.

## HALACARUS (POLYMELA) PANOPÆ, var. SQUAMIFERA, Lohm.

*Halacarus (Polymela) panopæ*, var. *squamifera*, Lohm., Ergeb. Plankton Exped., ii., 1893, p. 73.

*Host.*—Algæ.

*Hab.*—Pacific Ocean, Sydney ; Atlantic Ocean, mouth of the Amazon River.

## HALACARUS (POLYMELA) CHEVREUXI, Troues.

*Halacarus (Polymela) chevreuxi*, Troues., Naturaliste, (3), xi., 1889, p. 162 ; Bull. Sci. France Belgique, xx., 1889, p. 245 ; Lohman, Ergeb. Plankton Exped., ii., 1893, p. 73, pl. iv., f. 3-7, 10, 11, text fig. 6 ; Trouessart, Bull. Soc. Zool. France, xxv., 1900, p. 46.

*Hosts.*—Algæ and Corals.

*Hab.*—Pacific Ocean, Sydney, Chili ; Atlantic Ocean, Azores, Canaries ; Mediterranean Sea.

## HALACARUS OBLONGUS, Lohm.

*Halacarus oblongus*, Lohm., Ergeb. Plankton Exped., ii., 1893, p. 83, pl. ix., f. 1, 3, pl. x., f. 3, 7, text fig. 9.

*Hosts.*—Ascidians and Aleyonarians.

*Hab.*—Pacific Ocean, Sydney.

HALACARUS (COPIDOGNATHUS) LAMELLOSUS, *Lohm.*

*Halacarus (Copidognathus) lamellosus*, Lohm., *Ergeb. Plankton Exped.*, ii., 1893, p. 79, pl. vi., f. 1-9, pl. vii., f. 1, 4.

*Hosts.*—Algae and stationary animals.

*Hab.*—Pacific Ocean, Sydney; Atlantic Ocean, Bermudas and mouth of the Amazon.

HALACARUS (COPIDOGNATHUS) PULCHER, *Lohm.*

*Halacarus (Copidognathus) pulcher*, Lohm., *Ergeb. Plankton Exped.*, ii., 1893, p. 77, pl. v., f. 1-8, text fig. 7.

*Host.*—Algae.

*Hab.*—Pacific Ocean, Sydney; Atlantic Ocean, Bermudas and Ascension.

*Super-family* IXODOIDEA.

The Ixodoidea embrace by far the best known of all the Acarids, and are popularly termed ticks. They form a perfectly natural group, the members of which may be easily known by their general appearance and size, for none are so small that they may not be seen by the naked eye. All are parasitic, their hosts including sometimes man, various mammals, birds and reptiles. Their integument is coriaceous; the females are much larger than the males, and their bodies capable of considerable distension. Before distension they are somewhat triangular in outline, rather flat, with prominent, slender legs, and the beak-like rostrum in front. Of our Australian tick acquaintances some are indigenous, and some introduced—the latter which includes the Cattle Tick, *Rhipicephalus annulatus*, Say., being by far the most serious.

## Family ARGASIDÆ

Genus ARGAS, *Latr*

ARGAS REFLEXUS, *Fab.*

*Argas reflexus*, Fab., *Ent. Syst.*, iv., 1794, p. 426.

*Acarus reflexus*, Fab., *loc. cit.*

*Argas reflexus*, Latr., *Précis des Car. gen. des Ins.*, 1796, p. 178, an v.

*Rhynchoprion columbae*, *Mém. Aptérologique* Strasbourg, 1804, p. 69.

*Argas reflexus*, Neum., Mém. Soc. Zool. France, ix., 1896, pp. 4-6, f. 1-3.

*Hosts*.—Pigeons, fowls. Starcovici reported that he has seen the larvæ on the horse in Roumania.

*Hab*.—Europe (widely distributed). Australia (introduced).

ARGAS PERSICUS, *Fischer de Waldheim*.

*Argas persicus*, Fischer de Waldheim, Bull. Acad. Sci. Moscou, 1823.

*Argas persecus*, Laboulbène and P. Mégnin, Journ. l'anat. et de la physiol., xviii., 1882, p. 317, pl. xxi.-xxiii.

*Argas persecus*, Michael, Nat. Sci., May, 1892, p. 202; N.S.W. Agric. Gaz., vii., 1896, p. 593; and *ibid.*, xii., 1901, p. 1349.

*Argas persicus*, Neum., Mém. Soc. Zool. France, ix., 1896, pp. 7-9, f. 4, 5.

*Hosts*.—Human beings and probably domestic fowls.

*Hab*.—N. W. and N. E. Persia, from whence it appears to have spread into Europe; Adelaide, S.A. (introduced).

ARGAS AMERICANUS, *Packard*.

*Argas americanus*, Packard, *Arachnida*, U. S. Geol. Survey, 1872, p. 740, fig. 68.

*Argas americanus*, Frogg., N.S.W. Agric. Gaz., ix., 1898, p. 975; *ibid.*, xi., 1901, p. 542; *ibid.*, xii., 1901, pp. 1285 and 1349, pl.

*Argas americanus*, Neum., Mém. Soc. Zool. France, ix., 1896, pp. 9-12, f. 6-11.

*Argas americana*, Brown, Journ. Agric. Vict., i., 1902, pp. 86-90 and 209-216.

*Hosts*.—Domestic fowls and turkeys.

*Hab*.—America; Australia (widely distributed; introduced).

ARGAS SP.

*Argas sp.*, Fuller, N.S.W. Agric. Gaz., vii., 1896, p. 590, f. 1-4.

*Hosts*.—Domestic fowls.

*Hab*.—New South Wales.

## Family IXODIDÆ.

## Tribus A: RHIPICEPHALÆ.

## Genus HEMAPHYSALIS, Koch.

= *Rhipistoma*, Koch; *Gonixodes*, Dugés; *Opistodon*, Canestrini.

## HEMAPHYSALIS PAPUANA, Thor.

*Hemaphysalis papuana*, Thor., Ann. del Mus. civ. di St. Nat. di Genova, xviii., 1882, p. 62, pl. vi., f. 40-45.

*Hemaphysalis papuana*, Neum., Mém. Soc. Zool. France, x., 1897, p. 336, 337.

*Hosts*.—Not known. Canestrini found two examples, 1 ♂ 1 ♀, attached to a strip of skin from some mammal, in cotton which had been used for packing some insects and reptiles from Australia (Queensland).

*Hab.*—New Guinea (Ramoï), and Queensland.

## HEMAPHYSALIS LEACHI, Aud.

*Hemaphysalis leachi*, Aud., Description de l'Égypte, 2nd ed., xxii., 1827; Zoologie, *Explic. des planches*, p. 428.

*Rhipistoma leachi*, C. L. Koch, Archiv für Naturgeschichte, (1), x., 1844, p. 239.

*Rhipistoma ellipticum*, C. L. Koch, *loc. cit.*

*Rhipicephalus ellipticus*, C. L. Koch, Uebersicht des Arachniden-systems, iv., 1847, p. 135, pl. xxx., fig. 111.

*Rhipidostoma leachi*, Karsch, Monatsbericht K. Akad. Wis. Berlin, 1878, p. 337.

*Hemaphysalis leachi*, Neum., Mém. Soc. Zool. France, x., 1897, p. 347-350, f. 13-15; *loc. cit.*, xiv., 1901, p. 263.

*Hemaphysalis leachi*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 542.

*Hosts*.—In Eastern Ethiopia, *Felis pardus*, Linn. (leopard); cattle and horses at Grafton and Wallangra, N.S.W.

*Hab.*—Widely distributed over the African continent; Narrabri and Kempsey, N. S. Wales (introduced).

## HEMAPHYSALIS LONGICORNIS, Neum.

*Hemaphysalis longicornis*, Neum., Mém. Soc. Zool. France, xiv., 1901, p. 261, f. 2.

*Hosts*.—Cattle.

*Hab.*—Narrabri and Kempsey, N. S. Wales.

*Genus* RHIPICEPHALUS, Koch.

= *Acarus* (in part), Linn. ; *Ixodes* (in part), Latr. ; *Phauloixodes* Berl. ; *Boophilus*, Curt.

## RHIPICEPHALUS ANNULATUS, Say.

*Rhipicephalus annulatus* Say, Journ. Acad. Nat. Sci. Phil., ii. 1821, p. 75.

*Hemaphysalis rosea*, Koch, Archiv. f. Naturgesch., (1), x., 1844 p. 237 ; Uebersicht des Arachnidensystems, iv, 1847, p. 121 pl. xxvi., fig. 95 ♂, fig. 97 ♀.

*Ixodes bovis*, Riley, In Rep. on Diseases of Cattle by Gamgee, U. S. Dept. Agric., Special Rep., 1869.

*Ixodes bovis*, Fuller, Agric. Gaz. N.S.W., vii., 1896, p. 765, pls. i-iv., text figs.

*Ixodes identatus*, Gamgee, Rep. Diseases of Cattle, U.S. Dept. Agric., Special Rep., 1869.

*Ixodes dugesii*, Mégnin, Les Parasites et les Maladies Parasitaires, Paris, 1880.

*Hemaphysalis micropola*, Canest., Atti. della Soc. Veneto Trentina Sci. nat., xi, fasc. 1, 1887, p. 104, pl. ix., f. 3 and 5.

*Boophilus bovis*, Curt., Washington Biolog. Soc., 1890 ; *loc. cit.*, 1891 ; Journ. Compar. Med. and Vet. Archives, 1892, p. 1 ; Bull. Texas Agric. Exper. Sta., No. 24, 1892 ; N.S.W. Agric. Gaz. (reprint), vii., 1896, p. 454, pls. 1-3.

*Boophilus (Ixodes) bovis*, Fuller, N.S.W. Agric. Gaz., vii., 1896, p. 451, two text figs.

*Rhipicephalus calcaratus*, Birula, Bull. Acad. Imp. Sci. St. Pétersbourg, No. 4, 1895, p. 361, pl. ii., f. 10-20.

*Rhipicephalus annulatus*, Rainb., Rec. Aust. Mus., iii., 1899, p. 131.

*Rhipicephalus annulatus*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 542.

*Rhipicephalus annulatus*, Neum., Mém. Soc. Zool. France, x., 1897, p. 407, f. 37-42 ; *loc. cit.*, xiv., 1901, p. 276.

*Hosts*.—The hosts of this, now cosmopolitan, species are as follows :—In Texas, Maryland, Washington, Chicago, Baltimore, Kentucky, Kansas, Arkansas, New Mexico and Honduras : cattle ; Cuba : cattle and dogs ; Jamaica : cattle ; Florida : Deer (*Cariacus virginianus*, Bodd.) ; Guadeloupe, where it is known as the “Creole Tick : cattle ; Paragnay : under the bark of trees ; Timor : “Sambar” deer (*Rusa equinus*, Cuvier) ; Caucasus and Transcaucasus of Asia, Singapore : cattle ; Algiers and Morocco : cattle ; Barbary and Touarick : sheep.

*Hab*.—Cosmopolitan.

## RHIPICEPHALUS ANNULATUS, var. AUSTRALIS, Neum.

*Rhipicephalus annulatus*, var. *australis*, Neum., Mém. Soc. Zool. France, xiv., 1901, p. 280.

*Rhipicephalus annulatus*, var. *australis*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 542.

*Hosts*.—Cattle (Queensland Cattle Tick).

*Hab*.—Queensland.

## Tribus B: IXODÆ.

## Genus IXODES, Latr.

= *Acarus* (in part), Linn.; *Cynorhæstes* (in part), Herm.; *Crototus* (in part), Dum.

## IXODES ORNITHORHYNCHI, Lucas.

*Ixodes ornithorhynchi*, Lucas, Ann. Soc. Entom. France, (2), iv., 1845, p. 58, pl. i., f. 3.

*Ixodes ornithorhynchi*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 142, f. 18, 19.

*Host*.—*Ornithoryctes anatinus*, Shaw.

*Hab*.—Tasmania; also Marianne Isles, Micronesia (Monotreme recorded as host does not occur here).

## IXODES TASMANI, Neum.

*Ixodes tasmani*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 144, f. 20.

*Host*.—Not known.

*Hab*.—Tasmania; Is. of St. Pierre, Gt. Australian Bight.

## IXODES HOLOCYCLUS, Neum.

*Ixodes holocyclus*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 151, f. 24-26.

*Ixodes holocyclus*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 541.

*Hosts*.—Man, dog. Commonly known as "Bush" or "Dog" Tick. Froggatt quotes it as infesting low shrubs, one in particular—*Kunzia capitata*, Reichb.—has been called "Tick Bush" on this account. This tick is also recorded by Neumann as occurring on the Brush-tailed Pouch Mouse—*Phascogale peri-*

*cillata*, Shaw; the red squirrel of India, and another squirrel *Sciurus variabilis*, Geoff. The locality for the latter animal is given as India, but according to Trouessart ("Catalogus Mammalium") the habitat should be South and Central America.

*Hab.*—New South Wales, Queensland, India (?), S. and C. America (?).

*Genus* APONOMMA, *Neum.*

= *Ixodes*, Latr. (in part); *Ophiodes*, Murray (*nom. præoc.*).

APONOMMA TRIMACULATUM, *Lucas.*

*Aponomma trimaculatum*, Lucas, Ann. Soc. Ent. France, (5), viii., 1878, p. lxxvii.

*Ixodes trimaculatus*, Lucas, *loc. cit.*

*Aponomma trimaculatum*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 187, f. 41; *loc. cit.*, xiv., 1901, p. 291.

*Aponomma trimaculatum*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 542.

*Hosts.*—Cattle; Lace Lizards: *Varanus leucostigma* (*sic*) and *V. salvator*, Laur.

*Hab.*—New Guinea (or Guinea, *fide* Neumann); Palang, Sumatra; and Narrabri, N. S. Wales.

APONOMMA DECOROSUM, *L. Koch.*

*Aponomma decorosum*, L. Koch, Verhand. b. Ges. Wien., xvii., 1867, p. 241.

*Ixodes decorosus*, L. Koch, *loc. cit.*

*Ixodes varani*, L. Koch, *loc. cit.*

*Aponomma decorosum*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 194, f. 46-48.

*Aponomma decorosum*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 541.

*Aponomma decorosum*, Neum., Mém. Soc. Zool. France, xiv., 1901, p. 292, f. 9.

*Hosts.*—Lizards: *Varanus giganteus*, Gray; *Varanus sp.*: *V. varius*, Gray; Snakes: *Python sp.*: the Echidna: *Tachyglossus aculeatus*, Shaw.

*Hab.*—Australia: Brisbane, Sydney, Goulburn; Fiji.



APONOMMA HYDROSAURI, *Denny.*

*Aponomma hydrosauri*, Denny, Ann. Mag. Nat. Hist., xii., 1843, p. 314, pl. xvii., f. 4.

*Loxodes hydrosauri*, Denny, *loc. cit.*

*Anblyomma hydrosauri*, Koch, Archiv. f. Naturg., x., (1), 1844, p. 231.

*Aponomma hydrosauri*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 197, f. 49, 50.

*Aponomma hydrosauri*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 541.

*Hosts.*—Lizards: *Varanus varius*, Gray; *V. gouldi*, Gray; Echidna: *Tachyglossus aculeatus*, Shaw.

*Hab.*—Australia and Tasmania.

APONOMMA CONCOLOR, *Neum.*

*Aponomma concolor*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 198.

*Host.*—Echidna: *Tachyglossus aculeatus*, Shaw.

*Hab.*—Queensland.

*Obs.*—Neumann adds a note to his description, of which the following is a translation: "Founded on an individual labelled '*Loxodes coralie*, Gerv., ♂, on a *Hystrix*, Queensland,' and which only corresponds in its habits with *Lx. coralie*, Gervais, which latter is probably a *Dermacentor*."

APONOMMA ECINCTUM, *Neum.*

*Aponomma ecinctum*, Neum., Mém. Soc. Zool. France, xiv., 1901, p. 293.

*Aponomma ecinctum*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 542.

*Hosts.*—Beetles: *Aulacocyclus kaupi*, Macl.

*Hab.*—Queensland, New South Wales. It will also occur, doubtless, in other States.

*Genus* AMBLYOMMA, C. L. Koch.

= *Ixodes* (in part), Latr.

AMBLYOMMA TRIGUTTATUM, C. L. Koch.

*Amblyomma triguttatum*, C. L. Koch, Archiv. f. Naturg., (1), x., 1844, p. 255; Arachnidssystem, iv., 1847, p. 60, pl. ix., f. 33.

*Amblyomma triguttatum*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 215.

*Amblyomma triguttatum*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 541.

*Amblyomma triguttatum*, Neum., Mém. Soc. Zool. France, xiv., 1901, p. 298.

*Hosts*.—Horses, cattle, dogs; the "Paddy-melon," *Macropus thetidis*, Lesson; and the Echidna, *Tachyglossus aculeatus*, Shaw.

*Hab*.—N. S. Wales and Queensland.

AMBLYOMMA LIMBATUM, Neum.

*Amblyomma limbatum*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 231.

*Host*.—Not indicated.

*Hab*.—King Island, Bass Straits; Adelaide.

*Obs*.—Neumann thinks this may probably be a variety of *A. moreliæ*, L. Koch.

AMBLYOMMA POSTOCULATUM, Neum.

*Amblyomma postoculatum*, Neum., Mém. Soc. Zool. France, xii., 1899, p. 232.

*Host*.—Not indicated.

*Hab*.—King Island, Bass Straits; Adelaide.

AMBLYOMMA MORELIÆ, L. Koch

*Amblyomma moreliæ*, L. Koch, Verhandl. K. zool. bot. Ges. Wien., xvii., 1867, p. 241.

*Amblyomma morelia*, Neum., Mém. Zool. France, xii., 1899, p. 258.

*Amblyomma morelia*, Frogg., N.S.W. Agric. Gaz., xi., 1900, p. 541.

*Hosts*.—Horses, Kangaroos, and Carpet Snake, *Python spilotes*, Lacép

*Hab*.—N. S. Wales and Queensland.

### *Super-family* GAMASOIDEA.

The species included in this super-family are well-known to collectors, not only from the fact that many are common, but also because many pass a portion of their life attached to spiders, myriapods, and insects. These mites have, as a rule, a hard, leathery integument; some, however, are soft-bodied; they are broad, flat, short-legged, devoid of eyes, but exceedingly sensitive in point of touch; some of these mites can run rapidly, and leap, while others are lethargic, and seek protection when disturbed by feigning death. In some species the mouth-parts can be completely withdrawn into the body. Normally the mandibles are chelate, and the "fingers" denticulated. Examples occur in which these organs are elongate and styliform, and hence adapted for piercing.

#### *Family* GAMASIDÆ.

This is an extensive family, of world-wide distribution, and including many genera and species. And here, again, in working over literature, the student is brought face to face with the fact that more species have been described and recorded from New Guinea than from Australia. Doubtless some of the Papuan forms will, when the subject is properly worked, be found to occur upon our island continent. For a description of the internal anatomy of the Gamasidæ, and a description of their mode of coition, which latter is marvellous, and doubtless unique in nature, see Michael's paper "On the Variations in the Internal Anatomy of the Gamasinæ."<sup>11</sup> Species of Gamasidæ have been recorded not only from Arthropods, but also from the ears of cattle and horses and from the bodies of moles, and nests of the latter; some have been recorded as living on mosses and various plants. Amongst insects infested with these mites are beetles,

<sup>11</sup> Michael—Trans. Linn. Soc., v., pt. 8, 1892, p. 281, *et seq.*

bees and ants; some Gamasids feed upon the dead bodies of the latter. A species of *Lalaps* has been observed to jump upon an ant and ride about on it, without in any way disconcerting the Formicid. Each species of mite is said to prefer to live with a particular species of ant, although several kinds have been found in one nest. When the ants quit the nest the mites disappear also. Protonymphs have been collected from plants, and deutonymphs and tritonymphs from meals—flour, etc.—and houses.

*Genus* CELÆNOPSIS, *Kram.*

A number of mites from various parts of the world, including one from Australia, have been associated with Koch's genus *Celæno*, which was founded in 1835. This name, however, cannot stand for the Arachnida, as it was preoccupied for the Mammalia, Leach having in 1822 proposed *Celæno* for a bat. For the present, therefore, I suggest that as *Celæno*, Koch, has to sink into the ranks of synonymy, Kramer's *Celænopsis* be used instead.

CELÆNOPSIS AUSTRALIANA, *Canest.*

*Celænopsis australiana*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 715, pl. vi., fig. 2.

*Host.*—Beetles—type found upon a Cetonid.

*Hab.*—Australia.

*Genus* LÆLAPS, *Koch.*

LÆLAPS DOLIC[H]ANTHUS, *Canest.*

*Lalaps dolic[h]anthus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 709, pl. vii., f. 2 and 3.

*Host.*—Beetles—type found upon a Lamelicorn. We have in our collection, specimens probably referable to this species, from beetles and spiders collected by Mr. S. J. H. Moreau, at Antonio, near Rydal, N. S. Wales.

*Hab.*—Australia.

LÆLAPS CONIFERUS, *Canest.*

*Lalaps coniferus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 711, pl. vii., f. 4.

*Host.*—Beetles—type found upon a Longicorn.

*Hab.*—Australia.

*LÆLAPS STILOSUS, Canest.*

*Laelaps stilosus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 711,  
pl. ix., f. 3.

*Host.*—Beetles—type found upon a Longicorn.

*Hab.*—Australia.

*Genus SEIUS, Koch.*

Species of this genus have been recorded as occurring upon moss, and in caves; and protonymphs upon plants. Only one species has, so far, been described from Australia.

*SEIUS ACANTHURUS, Canest.*

*Seius acanthurus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 712,  
pl. ix., f. 1 and 2.

*Hab.*—Australia.

*Genus GAMASUS, Latr.**GAMASUS FLAVOLIMBATUS, L. Koch.*

*Gamasus flavolimbatus*, L. Koch, Verhandl. K. zool. bot. Ges.  
Wien, 1867, p. 242.

*Hab.*—Queensland.

*Genus BERLESIA, Canest.**BERLESIA RAPAX, Canest.*

*Berlesia rapax*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 714,  
pl. ix., f. 4.

*Hab.*—Australia.

*Family DERMANYSSIDÆ.*

The mites included in this family are soft-skinned, and parasitic on warm-blooded animals. Banks considers that whilst these Acarids differ much in general appearance from the Gamasidæ, to which they are closely allied by structure, it would nevertheless be better to abandon the group. The best character for separa-

tion from the Gamasidæ is their parasitic habits.<sup>12</sup> The family, as at present constituted, is divided into two sub-families, the Dermanyssinæ and Halarachninae, and they are distinguished from one another by, in the first of these, the presence of an anal plate, and in the latter, the absence thereof.

These mites are parasitic on bats, mice, rats and birds, and some of them have followed their hosts in their travels from place to place, and so have become not only widely distributed, but in some instances, cosmopolitan. Two species of *Dermanyssus* have found a home in many lands, and they are recorded below as parasitic on domestic birds. By the uninformed they are frequently confused with Bird Lice. Other forms doubtless occur, but none have been described from Australia.

*Genus* DERMANYSSUS, *Dugés*.

DERMANYSSUS GALLINÆ, *De Geer*.

*Dermanyssus gallinæ*, De Geer, *Mém. Inst.*, vii., 1778, p. 11.

*Acarus gallinæ*, De Geer, *loc. cit.*

*Dermanyssus gallinæ*, Oudem., *Tidjs. Voor Entom.*, xlv., 1902, p. 13, pl. i., f. 2, 3.

*Hosts*.—Domestic fowls.

*Hab*.—Cosmopolitan; Australia (introduced).

DERMANYSSUS AVIUM, *Dugés*.

*Dermanyssus avium*, Dugés, *Ann. Sci. Nat.*, (2), i., 1834, p. 18.

*Dermanyssus avium*, Murray, *Econom. Entom.* (n. d.), p. 169, 2 f. in text.

*Hosts*.—Pigeons, canaries, domestic fowls.

*Hab*.—Cosmopolitan; Australia (introduced).

*Obs*.—This species has been recorded as occurring on human beings, but it was accidental, and due to the individuals coming into contact with infested birds. It is also recorded that the removal of an infested henroost resulted in the cure of a case of supposed phthiriasis. The subject, a woman, was, but for these pests, clean and healthy.

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<sup>12</sup> Banks—*Loc. cit.*, p. 59.

*Family* UROPODIDÆ.

The Uropodidæ are distinct from the two preceding families in general appearance. The mites are small. They are usually found attached to insects, and are remarkable for the length of their mandibles, which are often twice as long as the body, slender, and terminating in delicate chelæ. They are not, strictly speaking, parasitic, their presence upon insects being for the purpose of transportation; moreover, those found upon insects, are attached by a pedicel of excrement, and owing to the fact that they are immature, have been termed *nympha pedunculata*. Up to the present two species have been described from Australia.

*Genus* UROPODA, Latr.

## UROPODA SPINULIPES, Canest.

*Uropoda spinulipes*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 714.

*Hab.*—Australia (on a Geotrupid).

*Genus* FEDRIZZIA, Canest.

## FEDRIZZIA GROSSIPES, Canest.

*Fedrizzia grossipes*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 707, pl. viii., f. 1 and 2.

*Hab.*—Australia (on a Geotrupid).

*Super-family* ORIBATOIDEA.

The Acarids included in this group are popularly known as "Beetle Mites." They are small and hard; some have rather short legs, and others extremely long ambulatory limbs. Superficially, these mites have a very beetle-like appearance, and this is doubtless the origin of the popular name. Oribatids may be easily distinguished from all other Acarids by the presence of a hair or *seta* which is seated on either side of the cephalothorax, and this arises from a small pore. These are usually termed *pseudo-stigmata*, and their function is unknown. The super-family under consideration is an extensive one and widely distributed. The species occur on dead wood, lichens, in moss, amongst dead leaves and forest debris generally: some are aquatic, occurring in mangrove swamps and on fresh-water and marine Algae; a few species are amphibious. These Acarids

are never parasitic, but are vegetable feeders. Usually they are oviparous, sometimes ovo-viviparous, and rarely viviparous. When the young emerge they have only three pairs of legs, but in the next stage they have four; two other changes or *ecdyses* occur, however, before the adult stage is attained. About twenty genera are included in the Oribatoidea, and these include many species, but the group has not been touched in Australia, notwithstanding the fact that quite a number of species occur, and some are stored away in private collections. I have seen specimens from the Jenolan District. In 1897 Canestrini described several from German New Guinea. Tryon has recorded one under the name *Leisoma*, *sp.*, from Durundur, Q., but this is the only reference I can find.

*Family* ORIBATIDÆ.

*Genus* LIACARUS, *Michael*.

= *Leisoma*, Nicolet (*nom. præoc.*).

LIACARUS *sp.*, *Tryon*.

*Liacarus sp.*, Tryon, *Insect and Fungus Pests*, 1889, p. 160.

*Leisoma sp.*, Tryon, *loc. cit.*

*Hab.*—Durundur, Queensland

*Family* TARSONEMIDÆ.

There are not many genera or species included in this family, but some forms are of the highest economic importance. These Acarids are exceedingly minute—in fact microscopic. All the species are parasitic—some on vegetation, some on cereals, such as grasses, rice and grain, and some on insects; one species has been found upon a mole. In Queensland, pine-apples and sugarcane are affected. The Tarsonemidæ are soft-bodied mites, the males conforming somewhat to the Tyroglyphid type; but the females differ not only from them, but from all other Acarians in having a clavate organ of uncertain use between legs i. and ii.<sup>13</sup> The mouth-parts are formed for sucking; mandibles slender and needle-like; palpi minute, barely visible; legs short and composed of five or six joints; anterior tarsi always terminated with one claw, the others have usually two and often a sucker; the posterior pairs of legs are widely remote from anterior pairs; in

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<sup>13</sup> Banks—*Loc. cit.*, p. 74.



the males of *Tarsonemus* they are almost at the tip of the abdomen; in some species the abdomen shows traces of segmentation. One species of *Pediculoides* and two of *Tarsonemus* have been recorded from Australia.

Genus *PEDICULOIDES*, *Targioni-Tozzetti*.

= *Heteropus*, Pal.

*PEDICULOIDES ALASTORIS*, *Frogg.*

*Pediculoides alastoris*, Frogg., Proc. Linn. Soc. N. S. Wales, ix., (2), 1894, p. 259.

*Heteropus alastoris*, Frogg., *loc. cit.*

*Host*.—*Alastor eriurgus*, Sauss. (a solitary wasp).

*Hab*.—Granville, N. S. Wales.

*Obs*.—Some exotic species of this genus are parasitic on destructive insects. In the gravid female the abdomen swells prodigiously. This is due to the development of the eggs. These not only hatch within the parent, but the young obtain their entire nourishment there, and issue as sexually mature males and females. The new brood usually wander for a time over the mother's body and then pair. Banks figures a normal and a gravid female.<sup>14</sup>

Genus *TARSONEMUS*, *Cuñest.*

*TARSONEMUS BANCROFTI*, *Mich. (m.s.)*

*Tarsonemus bancrofti*, Mich. (m.s.), Bull. Roy. Gardens Kew, 1890, p. 85.

*Tarsonemus bancrofti*, Insect Life, iii., 1890, p. 31.

*Tarsonemus bancrofti*, March., Bull. Soc. Ent. France, 1902, pp. 103, 104.

*Tarsonemus bancrofti*, Banks, Proc. U. States Nat. Mus., xxviii., 1904, p. 77

*Host Plant*—Sugar canes, *Saccharum officinarum*.

*Hab*.—Queensland and Barbadoes.

*Obs*.—*T. bancrofti*, Michael, is associated with the sugar-cane disease known in Queensland as "Red Rust." This disease has been long established in Queensland, Dr. Bancroft having in

<sup>14</sup> Banks—*Loc. cit.*, pp. 74, 75. f. 144, 146.

1876 reported the matter to Parliament. In a "Bulletin of the Royal Gardens, Kew,"<sup>15</sup> I read as follows: "It appears not improbable that the disease is identical with one which has been noted in the Malayan Archipelago, and in the Mauritius,<sup>16</sup> in the Society Islands according to Professor Liversidge, and in Bahia."

*TARSONEMUS ANANAS, Tryon.*

*Tarsonemus ananas*, Tryon, Queensl. Agric. Journ., iii., pt. 6, 1898, pp. 462-464, pl. lxxi., f. 1, 2, 5, 6.

*Tarsonemus anasa*, Banks, Proc. U. States Nat. Mus., xxviii., 1904, p. 77.

*Host Plant*.—Pine apples (*Ananasa* sp.).

*Hab.*—S. Queensland.

*Family TYROGLYPHIDÆ.*

This is another small family of mites, yet notwithstanding, one of great economic importance, seeing that it embraces species notorious by reason of their infesting foods—cheese, cereals, tubers, bulbs; some are also found attached to living mammals and insects during what is termed the hypopial stage. For species in this stage three genera were proposed on the supposition that they were adult Acarids. These were *Hypopus*, Dugés, *Homopus*, Koch, and *Trichodactylus*, Duf. Mègnin<sup>17</sup> made lengthy observations on the zoological position and economy of Acarids described under these generic names, and showed that they were all earlier stages of certain Tyroglyphidæ. The two latter names were therefore dropped, whilst the first was retained and is still used as a name to distinguish these Acarids at a certain stage of their development—the "nymphé cuirassée, adventive, hétéromorphe."

Tyroglyphid mites are very small, pale-coloured, very soft, and have usually prominent chelate mandibles and moderately long legs, the tarsi terminating with one claw; the body is about twice as long as broad. The adults are certainly blind, but in some hypopial forms there are organs which have never been satisfactorily defined and which may possibly be eyes. The division between the cephalothorax and abdomen is invariably

<sup>15</sup> Michael—Bull. Roy. Gardens Kew, 1890, p. 86.

<sup>16</sup> Liversidge—Journ. Roy. Hort. Soc., New Ser., ii., 1890, pp. cxxxi.-cxxxii.; *loc. cit.*, iii., 1891, pp. 14-17.

<sup>17</sup> Mègnin—Comp. Rend., lxxvii., 1878, pp. 129-132, and pp. 492-3.

distinct, and the upper part of the body is furnished with a few hairs, and these are generally long. We are indebted to the labours of Michael<sup>18</sup> and Nalepa<sup>19</sup> for our knowledge of the anatomy of these animals, and to their writings students are directed. The mode of coition in the Tyroglyphidæ is exactly similar to that of the Analgesidæ. Behind the *anus* there is a small opening—the copulative aperture. In *Glyciphagus*, the *bursa copulatrix* projects externally into a small cone. Copulation is not performed through the *vulva*, but by this special opening.<sup>20</sup> This opening leads to a *receptaculum seminis*, which connects by a small duct to the ovaries. The transformations of these animals are amongst the most marvellous of the animal kingdom. All Tyroglyphidæ (except *Carpoglyphus*, Robin) appear to lay eggs, sometimes of a large size. The young on hatching are six-legged, and after moulting obtain two more. From thence they may pass on to the adult state in the normal way, but more frequently they pass through what has been already referred to as the *hypopial stage*. The *Hypopus* is very distinct from the octopod nymph from which it has developed. The body is hard and chitinous; there is no mouth orifice, and no distinct mouth parts. The legs are short and ill-adapted for walking. On the ventral surface at the posterior extremity there is an area distinct from the general surface. This area is provided with sucking discs, by means of which the animal clings to the body of an insect or other creature, and so the Acarid is carried about until it finds a suitable locality to undergo its next great change or molt, which transforms it into an octopod nymph that will feed and ultimately develop into an adult mite. Hence the hypopial stage is a phase in the life of a Tyroglyphid for the purpose of migration, but the causes which induce a nymph to transform to the *Hypopus* are not known.

When Tyroglyphids swarm in stored foods—cereals and the like—or buildings it is exceedingly difficult to combat them, since as they have no trachæ they are not very susceptible to fumigation, though some will succumb to the treatment. The writer once saw a grain merchant's store in Sydney in which these little wretches swarmed in countless millions, to eradicate which much time and no little expense had to be devoted.

Two indigenous species of Tyroglyphidæ have been recorded from Australia, but in addition to these others occur which have a more or less cosmopolitan range.

<sup>18</sup> Michael—Journ. Quek. Club, 1879, pp. 223-230, pl. xiii.

<sup>19</sup> Nalepa—Sitz. K. Akad. Wien., 1883, xc., pp. 197-228; Ann. Mag. Nat. Hist., xiv., 1883, pp. 369-371 (abstract).

<sup>20</sup> Banks—Proc. U. States Nat. Museum, xxviii., 1894, p. 79, 80.

*Genus* TYROGLYPHUS, Latr.

## TYROGLYPHUS QUEENSLANDICUS, Canest.

*Tyroglyphus queenslandicus*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 721.

*Hab.*—Queensland (on a Cetonid beetle).

## TYROGLYPHUS ENTOMOPHAGUS, Laboub.

*Tyroglyphus entomophagus*, Laboub., An. Soc. Ent. France, 1862.

*Tyroglyphus entomophagus*, Murray, Econom. Entom. (n.d.), p. 263.

*Hab.*—Cosmopolitan; Australia (introduced). Attacks entomological collections. According to Murray, "large insects, with the body full of fatty particles, those which have not lived long or which have been brought up in captivity, and which have not paired, and those which have become greasy (to use the technical expression), are most liable to attack."

## TYROGLYPHUS SIRO, Linn.

*Tyroglyphus siro*, Linn., Syst. Nat., x. ed., 1758, p. 616.

*Acarus siro*, Linn., *loc. cit.*

*Tyroglyphus siro*, Murray, Econom. Entom., (n.d.), p. 267, with figs.

*Hab.*—Cosmopolitan; Australia (introduced). Infests cheese, grain, dried meats.

*Genus* PULTEA, Canest.

## PULTEA DISCOIDALIS, Canest.

*Pultra discoidalis*, Canest., Atti. Ist. Venet., (6), ii., 1885, p. 720, pl. vi., f. 1.

*Hab.*—Australia (on a phytophagus beetle).

*Genus* ALEUROBIUS, Canest.

## ALEUROBIUS FARINÆ, De Geer.

*Aleurobius farinae*, De Geer, Mém. Inst., vii., 1778, p. 97.

*Acarus farinae*, De Geer, *loc. cit.*

*Hab.*—Cosmopolitan; Australia (introduced). Infests flour, grain, and stored foods. Does not appear to be common.

*Obs.*—Tryon refers to and figures a fungus-eating Tyroglyphid mite (? gen. *et* sp.).<sup>21</sup>

<sup>21</sup> Tryon—Queensl. Agric. Journ., 1898, p. 456, pl. lxxi., f. 3, 4.

*Genus* GLYCIPHAGUS, *Hering*.GLYCIPHAGUS DOMESTICUS, *De Geer*.

*Glyciphagus domesticus*, De Geer, Mém. Ins., vii., 1778, p. 89.

*Acarus domesticus*, De Geer, *loc. cit.*

*Glyciphagus domesticus*, Oudm., Tijds. Voor. Entom., xl., 1897, p. 251.

? *Glyciphagus prunorum*, Hering, Die Kratzmilben, 1835, p. 619.

*Hab.*—Cosmopolitan ; Australia (introduced). This species is sometimes found in cork, dust, tobacco, collections of herbaria, meals (such as flour), furniture. When it occurs in the latter it may be present in thousands. I have seen furniture in a house at Paddington, Sydney, where these Acarids were literally swarming. They feed on the animal fats of horse-hair when the latter has not been thoroughly cleaned. The species is also known to infest all kinds of dried vegetable and animal matter which is not too hard ; hay and fodder in stables, many vegetables and dungs, dried insects and fruits, sugar, and condensed milk which has been left exposed. *G. domesticus* is probably synonymous with Hering's *G. prunorum*, but the latter cannot be satisfactorily determined from the original description and figure which is lacking in certain important details. This Acarid is responsible for what is known as "grocers' itch." *G. domesticus* has also been recorded from the European "Blue Tit;" *Parus ceruleus*, Linn.

*Obs.*—Other species of this genus probably occur here, as in other parts of the world, seeing that bulbs and tubers are infested by them.

*Family* ANALGESIDÆ.

The Analgesidæ or "Bird Mites," is an extensive family including about thirty-one genera and seven sub-genera. These Acarids are found on birds all over the world, and their presence is regarded as beneficial to a host, from the fact that they keep the feathers and skin clean. Except the ticks few Acarids are better known than the Analgesidæ. Birds being so sought after by museums as well as private collectors, it is only natural that these little animals should find their way into collections, and so receive attention at the hands of systematists. A few species have been recorded from Australia and these are enumerated below. The Analgesidæ are more or less elongated animals with soft and transversely wrinkled skin ; usually the cephalothorax and abdomen are well-defined, but they are not endowed with

eyes nor stigmata ; the legs are usually short and stout, and arranged in two distinct groups ; the limbs have five joints, are provided with a few rather long hairs, systematically arranged, and each terminates with a rather large concave sucker, known as the *ambulacrum* ; sometimes only one tarsal claw is present, and sometimes two. The mandibles are usually chelate, and finely toothed at the tip. The upper surface of the body is provided with a series of stiff bristles, and these present helpful specific characters. In dealing with the preceding family reference was made to the method of coition of the Tyroglyphidæ and Analgesidæ, so that the matter need not be referred to again here. The development and life history of this family is not well understood, but some species, at any rate, are known to pass through a hypopial stage. The egg is described as being large, elongate, slightly curved ; the newly hatched larva has usually six legs, but some forms occur in which only four are apparent. Although the nymph has the general form of the adult mite, it lacks the genital organs.

*Genus* FREYANA, *Haller.*

*Sub-Genus* EUFREYANA, *Canest. & Kram.*

FREYANA (E.) TARANDUS, *Troues. & Neum.*

*Freyana* (E.) *tarandus*, Troues. & Neum., Bull. Sci. France Belgique, 1888, xxix., p. 333, pl. xxii., f. 1 and 2.

*Hosts.*—*Ibis melanocephala*, Lath., *I. strictipennis*, J. Gd., *I. molucca*, Cuv., and *Theristicus melanopis*, Gm.

*Hab.*—India ; Moluccas, Australia, and Patagonia.

*Sub-Genus* MICHAELIA, *Troues.*

FREYANA (M.) CAPUT-MEDUSÆ, *Troues.*

*Freyana* (M.) *caput-medusæ*, Troues., Bull. Soc. Angers, xvi., 1886, p. 100.

*Michaelia caput-medusæ*, Troues. & Neum., Bull. Sci. France Belgique, xix., 1888, p. 374.

*Hosts.*—*Sula bassana*, Linn., and other species of the same genus.

*Hab.*—Australia, New Zealand, Europe, N. America.

## Genus PTEROLICHUS, Robin.

## Sub-Genus EUPTEROLICHUS, Canest.

## PTEROLICHUS (E.) ORNATUS, Mégn. &amp; Troues.

*Pterolichus (E.) ornatus*, Mégn. & Troues., Journ. Micrograph., viii., 1884, p. 258, f. 2.

*Hosts*.—*Papegais*, *spp.*

*Hab.*—Australia, New Guinea, India.

## PTEROLICHUS (E.) PHYLLOPROCTUS, var. MINOR, Mégn. &amp; Troues.

*Pterolichus (E.) phylloproctus*, var. *minor*, Mégn. and Troues., Journ. Micrograph., viii., 1884, p. 334.

*Hosts*.—*Haliastur indus* var. *girrenera*, Vieill.

*Hab.*—Australia.

## Sub-Genus PROTOLICHUS, Troues.

## PTEROLICHUS (PR.) BRACHIATUS, var. CRASSIOR, Troues.

*Pterolichus (Pr.) brachiatus*, var. *crassior*, Troues., Journ. Micrograph., viii., 1884, p. 529.

*Hosts*.—*Trichoglossus novæhollandiæ*, Gm., *Glossopsittacus concinnus*, G. Shaw, *Loriculus selateri*, Wall.

*Hab.*—Australia, New Guinea, Celebes.

## PTEROLICHUS (PR.) LUNULA, Robin.

*Pterolichus (Pr.) lunula*, Robin, Journ. Anat. et Physiol., xiii., p. 411, pl. xxiii., f. 1-3.

*Host*.—*Melopsittacus undulatus*, G. Shaw.

*Hab.*—Australia.

## PTEROLICHUS (PR.) CHIRAGRICUS, Mégn. &amp; Troues.

*Pterolichus (Pr.) chiragricus*, Mégn. & Troues., Journ. Micrograph., viii., 1884, p. 261.

*Pterolichus affinis* (part), Mégn. & Troues., *loc. cit.*, p. 262.

*Hosts*.—*Pezoporos formosus*, Lath., *Platyercus jarcolus*, J. Gd., and *P. elegans*, Gm.

*Hab.*—Australia, New Zealand.

PTEROLICHUS (PR.) VELIFER, *Mégn. & Troues.*

*Pterolichus (Pr.) velifer*, Mégn. & Troues., Journ. Micrograph., viii., 1884, p. 262.

*Pterolichus (Pr.) affinis* (part), Mégn. & Troues., *loc. cit.*, p. 262.  
 ,, *velifer*, Troues., Bull. Soc. Ent. France, 1898,  
 p. 290.

*Hosts.*—*Nymphicus cornutus*, Gm., *Pyrrhulopsis personata*, G. R. Gray, and *Platycercus flavicollis*, J. Gd.

*Hab.*—Fiji, New Caledonia, Australia.

PTEROLICHUS (PR.) FAVETTEI, *Troues.*

*Pterolichus (Pr.) favettei*, Troues., Bull. Soc. Ent. France, 1898,  
 p. 290.

*Hosts.*—*Nestor notabilis*, J. Gd., *N. meridionalis*, Gm., *Psephotus xanthorrhous*, Bp., and *Microglossus aterrimus*, Gm.

*Hab.*—Australia, New Guinea, New Zealand.

PTEROLICHUS (PR.) FALCULIGER, *Troues.*

*Pterolichus (Pr.) falculiger*, Troues., Journ. Micrograph., viii., 1884, p. 531.

*Host.*—*Glossopsittacus concinnus*, G. Shaw.

*Hab.*—Australia.

*Sub-Genus* PSEUDALLOPTES, *Troues.*PTEROLICHUS (PS.) AQUILINUS, *var. MILVULINA*, *Troues.*

*Pterolichus (Ps.) aquilinus*, *var. milvulina*, Troues., Journ. Micrograph., viii., 1884, p. 573.

*Hosts.*—*Milvus milvus*, Linn., and *Haliaster indus var. girrenera*, Viell.

*Hab.*—Australia and New Guinea.

PTEROLICHUS (PS.) SPATHULIGER, *Troues.*

*Pterolichus (Ps.) spathuliger*, Troues., Journ. Micrograph., viii., 1884, p. 577.

*Host.*—*Calyptorhynchus macrorhynchus*, J. Gd.

*Hab.*—Australia.



PTEROLICHUS (Ps.) CULTRIVENTRIS, Troues.

*Pterolichus (Ps.) cultriventris*, Troues., Journ. Micrograph., viii., 1884, p. 577.

*Host.*—*Glossopsittacus concinnus*, G. Shaw.

*Hab.*—Australia.

Genus ANALGES, Nitzsch.

ANALGES TETRACENTRUS, Troues.

*Analges tetracentrus*, Troues., Bull. Soc. Angers, xxviii., 1899, p. 30.

*Host.*—*Psephotus hamatonatus*, J. Gd.

*Hab.*—Australia.

Genus PROTALGES, Troues.

PROTALGES AUSTRALIS, Troues.

*Protalges australis*, Troues., Bull. Soc. Angers, xiv., 1885, p. 55.

*Host.*—*Glyciphila fasciata*, J. Gd.

*Hab.*—Australia.

PROTALGES CARTUS, Troues.

*Protalges cartus*, Troues., Bull. Soc. Angers, xiv., 1885, p. 56.

*Host.*—*Platycreus elegans*, Gm.

*Hab.*—Australia.

Genus ALLOPTES, Canest.

ALLOPTES LOBULATUS, Troues.

*Alloptes lobulatus*, Troues., Bull. Soc. Angers, xiv., 1885, p. 65.

*Host.*—*Meliornis sericeus*, J. Gd.

*Hab.*—Australia.

ALLOPTES SECURIGER, Troues.

*Alloptes securiger*, Troues., Bull. Soc. Angers, xiv., 1885, p. 65.

*Host.*—*Dicaeum hirundinaceum*, Shaw and Nodd.

*Hab.*—Australia.

ALLOPTES CORYMBOPHORUS, *Troues. & Neum.*

*Alloptes corymbophorus*, Troues. & Neum., Bull. Sci. France  
Belgique, xix., 1888, p. 367, pl. xxv., f. 4.

*Host.*—*Ibis molucca*, Cuv.

*Hab.*—Australia.

ALLOPTES MAJOR, *Troues.*

*Alloptes major*, Troues., Bull. Soc. Angers, xiv., 1885, p. 78.

*Host.*—*Menura superba*, Davies.

*Hab.*—Australia.

*Genus* TROU ESSARTIA, *Canest.*

= *Pterocolus*, Schön., (*nom. præoc.*)

TROU ESSARTIA CAUDACUTA, *Troues.*

*Trouessartia caudacuta*, Troues., Bull. Soc. Angers, xxviii., 1899,  
p. 171.

*Pterocolus caudacutus*, Troues., *loc. cit.*

*Host.*—*Lobivanellus lobatus*, Lath.

*Hab.*—Australia.

*Genus* PTERODECTES, *Robin.*PTERODECTES PARADISIACUS, *Troues.*

*Pterodectes paradisiacus*, Troues., Bull. Soc. Angers, xiv., 1885,  
p. 80.

*Hosts.*—*Pardisea minor*, G. Shaw, and *Sericulus melinus*, Lath.

*Hab.*—Australia and New Guinea.

PTERODECTES MANICATUS, *Troues.*

*Pterodectes manicatus*, Troues., Bull. Soc. Angers, xiv., 1885, p.  
81.

*Host.*—*Glycyphila fasciata*, J. Gd.

*Hab.*—Australia.

*Family* LÍSTROPHORIDÆ.

Only one species of this small family has been recorded from the Australian region, and that from Tasmania. These parasites live upon small mammals, including bats. They are small, the body usually tapering a little posteriorly, legs widely separated, sometimes—according to those who have studied the family—each pair is at an equal distance from the adjoining ones; dorsally there are a few short hairs with longer ones at the tip: the surface is usually transversely striate, and the rostrum or beak forms a distinct cone on the front of the head; palpi simple, filiform, three-jointed; mandibles very small, commonly chelate; genital apertures situate between third and fourth coxæ; anus at tip of body. Males invariably differently shaped to females and provided with a pair of copulatory suckers near tip of venter.<sup>22</sup>

The Listrophoridae feed on the hairs of their hosts.

*Genus* CAMPYLOCHIRUS, Troues

## CAMPYLOCHIRUS CHELOPUS, Troues.

*Campylochirus chelopus*, Troues., Compt. Rend. Soc. Biol., xlv., 1893, p. 699.

*Host.*—Opossum (*Pseudochirus cooki*, Desm.).

*Hab.*—Tasmania.

*Family* SARCOPTIDÆ.

This family includes a number of species which are, unquestionably, the most disgusting of the entire Acarid Group. These microscopic animals are notorious for their parasitism on the human subject and domesticated animals, causing intense physical suffering and often great monetary loss. *Sarcoptes scabiei*, Geer, is unfortunately common in Australia, and affects human beings. It is responsible for what is probably one of the oldest skin diseases known. The Greeks called it ψώρα (from ψῶ, I rub) and the ancient Romans *scabies* (from *scabere*, to scratch). In England it is *itch*, *scald*, *yuck* (*mango*); *gale* in France; *Krätze* and *Krätzausschlag* in Germany; *scabia*, *rogna* and *raspa* in Italy; and *sarna*, *roña* in Spain. Speaking more accurately, *scabies* is known to medical science as *acariasis*. The history of the disease is a most interesting one which the reader may peruse for himself.<sup>23</sup>

<sup>22</sup> Banks *Loc. cit.*, p. 94.

<sup>23</sup> Neumann—Parasites and Parasitic Diseases of Domesticated Animals, translated by George Fleming, London, 1892, pp. 112-116.

The Sarcoptidæ are white, semi-globose; the body entire; surface transversely striated and provided with a few bristles, often short, stout and sharp-pointed; legs short and arranged in two groups, and of these the posterior pairs are usually the shorter; the tarsi usually terminate with a sharp claw and a long pedicellate sucker; the claw or sucker may, however, be absent and in place thereof there may be a long bristle: the beak is prominent and the palpi small and three-jointed, and lie closely pressed to the sides of the beak beneath.

The female Sarcopitid burrows into the skin of its host, depositing its eggs as it goes. On hatching out, the young, which are six-legged, start burrowing on their own account, so that the sufferer may be affected in patches. The *cuniculi* or burrows are close to the surface, so that as the epidermis loosens scaly effects are produced. The irritation produced causes vesicles or pustules to occur, and these may become ulcerated by scratching. When the female has completed the task of depositing her eggs, she dies at the end of her burrow. The presence of Sarcopitids on the lower animals is the cause of what is popularly known as mange. The latter disease is common enough on dogs and cats; it occasionally occurs on horses and sheep, but no cases are on record in respect of cattle; pigs, too, I am informed by Mr. J. D. Stewart, Government Veterinary Surgeon, are in New South Wales at any rate, free from Sarcopitid troubles, and I believe I am correct in saying that the same remark applies to the other States.

*Genus* NOTOEDRES *Raill*

NOTOEDRES CATI, *Hering*.

*Notoedres cati*, Hering, N. Acta. Ac. Leop., xviii. 1838, p. 605, pl. xlv., f. 9, 10.

*Sarcoptes cati*, Hering, *loc. cit.*

*Sarcoptes cati*, Neum., Parasites and Parasitic Diseases of Domesticated Animals (Fleming trans.), 1892, p. 125, f. 72 and p. 208.

*Sarcoptes notoedres*, var. *cati*, Mégn., Paras., 1880, p. 174.

*Notodrus cati*, Canest., Prosp. Acarof., vi., 1894, p. 752.

*Notodrus cati*, Berl., Acari. Myriap. Scorp. Italia, fasc. 79, (2), 1896.

*Sarcoptes minor*, Fürstenb., Krätzm., 1861, p. 215, pl. 8.

*Hosts*.—Cats, rabbits.

*Hab*.—Europe, Australia (introduced).

*Genus SARCOPTES, Latr.*SARCOPTES CANIS, *Gerl.*

- Sarcoptes canis*, Gerl., Krätz., 1857, p. 141, pl. ii. and iii., f. 11-14.  
*Sarcoptes canis*, Canest., Prosp. Acarof., vi., 1894, p. 741, pl. lxiii., f. 1-3.  
*Sarcoptes canis*, Neum., Parasites and Parasitic Diseases of Domesticated Animals, 1892, p. 124 and p. 202.  
*Sarcoptes canis*, Berl., Acari. Myriap. Scorp. Italia, fasc. 79, (1), 1896.  
*Sarcoptes squamiferus* (part), Fürstenb., Krätzm., 1861, p. 214, pl. iv.

*Hosts*.—The dog, and sometimes man.

*Hab*.—Cosmopolitan ; Australia (introduced).

SARCOPTES EQUI, *Gerl.*

- Sarcoptes equi*, Gerl. (non *Sarcoptes equi*, Hering, 1838), Krätz., 1857, p. 72, pl. ii., f. 8-10.  
*Sarcoptes equi*, Canest., Prosp. Acarof., vi., 1894, p. 745.  
*Sarcoptes scabiei*, var. *equi*, Mégn., Paras., 1880, p. 164, pl. ix.  
*Sarcoptes scabiei*, var. *equi*, Neum., Parasites and Parasitic Diseases of Domesticated Animals, 1892, pp. 122, 123, f. 65-69.

*Hosts*.—The horse ; sometimes man.

*Hab*.—Cosmopolitan ; Australia (introduced).

SARCOPTES SCABIEI, *Geer.*

- Sarcoptes scabiei*, Geer, Mém. Hist. Ins., vii., 1778, p. 94, pl. v., f. 12, 13.  
*Acarus scabei*, Geer, *loc. cit.*  
*Acarus siro* (part) + *Acarus exulcerans*? Linn., Syst. Nat. ed. x., 1758, pp. 616, 617.  
*Sarcoptes hominis*, Hering, N. Acta. Ac. Leop., 1838, xviii., p. 584.  
*Sarcoptes scabiei*, var. *hominis*, Mégn., Paras., 1880, p. 169.  
*Sarcoptes hominis*, Canest., Prosp. Acarof., vi., 1894, p. 738, pl. 70.  
*Sarcoptes hominis*, Banks, Proc. U. States Nat. Mus., xxviii., 1904, pp. 96, 97, f. 181, 182 and 184.  
*Sarcoptes communis* (part), Delaf. & Bourg., Mém. Pres. Ac. France, xvi., 1862, p. 290.

*Host.*—The human subject.

*Obs.*—I am indebted to Prof. D. A. Welsh and Dr. H. G. Chapman, of the Sydney University, for much generous assistance in my study of parasites affecting the human subject. From the former, who kindly communicated with Dr. F. A. Bennet, I learn that *scabies* is fairly common amongst patients presenting themselves at the Royal Prince Alfred Hospital. Dr. Corbin, Medical Superintendent at the Sydney Hospital, informs me that *scabies* is one of the commonest skin diseases; and from Dr. Chapman who, on my behalf, communicated with Dr. Noyes of Melbourne, I learn that much the same condition of things obtains in the Victorian capital.

*Hab.*—Cosmopolitan; Australia (introduced).

SARCOPTES WOMBATI, *Raill.*

*Sarcoptes wombati*, Raill., Zool., 2nd ed., 1893, p. 659.  
*Sarcoptes scabiei*, var. *wombati*, Raill., *loc. cit.*

*Hosts.*—The Tasmanian Wombat (*Phascalomys ursinus*, G. Shaw); sometimes found upon man.

*Hab.*—Tasmania.

Genus CNEMIDOCOPTES, *Fürstb.*

CNEMIDOCOPTES MUTANS, *Robin.*

*Cnemidocoptes mutans*, Robin, Bull. Soc. Moscou, xxxiii., 1860, p. 184.

*Sarcoptes mutans*, Robin, *loc. cit.*

*Cnemidocoptes mutans*, Canest., Prosp. Acarof., vi., 1894, p. 755, pl. lxx., f. 1-3, pl. lxxvi., f. 1-4.

*Cnemidocoptes mutans*, Berl., Acari. Myriap. Scorp. Italia, fasc. 84, (6), 1897.

*Sarcoptes anacanthos*, Delaf. & Bourgn., Mém. Pres. Ac. France, xvi., 1862, p. 261.

*Cnemidokoptes viviparus*, Fürstenb., Mt. Ver. Vorpomm., ii., 1870, p. 56.

*Sarcoptes mutans*, Brads., N. S. Wales Agric. Gaz., xvii., 1906, pp. 125-131, pl. and text figs.

*Hosts.*—Domestic fowls. This mite, *C. mutans*, is responsible for the disease in poultry known as "Scaly Leg."

*Hab.*—Cosmopolitan; Rockdale, N.S.W. (introduced).

*Genus PSOROPTES, Gerv.*PSOROPTES EQUI, *Hering.*

*Psoroptes equi*, Hering, N. Acta. Ac. Leop., xviii., 1838, p. 585, pl. xliii., f. 1, 2.

*Sarcoptes equi*, Hering, *loc. cit.*

*Dermatodectes equi*, Gerl., Krätz., 1857, p. 90, pl. iv.

*Psoroptes longirostris*, var. *equi*, Mégn., Paras., 1880, p. 191, pl. xiii.

*Psoroptes equi*, Canest., Prosp. Acarof., vi., 1894, p. 761.

*Psoroptes communis* var. *equi*, Neum., Parasites and Parasitic Diseases of Domesticated Animals, 1892, pp. 126-129, f. 73-79.

*Dermatocoptes equi*, Fürstenb., Krätz., 1861, p. 220, pls. 12-15

*Hosts.*—Horse, ass.

*Hab.*—Cosmopolitan ; Australia (introduced).

*Genus CHORIOPTES, Gerv.*? CHORIOPTES OVIS, *Raill.*

? *Chorioptes ovis*, Raill., Zool., 2nd ed., 1893, p. 675.

*Chorioptes symbiotes*, var. *ovis*, Raill., *loc. cit.*

*Host.*—Sheep. This species is, I believe, *C. ovis* of Railliet. The form occurring in Australia was introduced on sheep from America. The species included in this genus are restricted in their attacks to certain parts of the animal, as the feet, the ears or neck. In this State the feet are attacked, and give rise to what is known as "foot mange." Cases of this trouble are, however, few and far between.

*Hab.*—Europe ?, America ?, Australia (introduced).

*Family ERIOPHYIDÆ.*

The family, although including only a few genera is rather extensive in point of species. Only one form has, so far, been recorded from Australia—*Eryophes pyri*, Scheuten, and this is parasitic on the pear. All the species are of strictly phytophagus habits, and many of them cause galls to form on the leaves of their food plants. The early history of the study of these animals is interesting. Some individuals in the old school of botanists regarded Eriophyd galls as Cryptogams, and described them as such under the generic names *Erinium*, etc. These gall mites are an extraordinary

group, and it is scarcely to be marvelled that they should, before they were properly understood, have been regarded as occupying a position in the domain of botany. These mites differ from all others in that the adults have only *four* legs, all seated near the anterior part of the body. The animal is long and tapering, divided into two parts—cephalothorax and abdomen; the former is short and broad, the latter long and multi-articulate.

*Genus* ERIOPHES, *Sieb. & Nal.*

ERIOPHES PYRI, *Pagenst.*

- Eriophes pyri*, Pagenst., Verh. Ver. Heidelberg, i., 1857, p. 48.  
*Phytophus pyri*, Nal., Anz. Ak. Wien., xxvi., 1889, p. 162; Sitzb. Ak. Wien, xcix., 1890, p. 50, pl. iv., f. 1, 2.  
*Phytophus arianus* + *P. colomeastri* + *P. sorbi*, Canest., Atti. Soc. Ven.-Trent., xii., 1890, pp. 16, 20, 21, pl., f. 7-9, pl. vi., f. 14.  
*Phytophus aronia*, Canest., Difesa dai Parassiti, i., 1890, p. 282.  
*Phytophus pyri*, French, Handb. Destruc. Ins. Vict., pt. 1, 1891, pp. 119-123, pl. xiv.  
*Eriophyes pyri*, Nal., Das Tier., Lief. 4, 1898, p. 25.

*Host Plant*.—Pear trees.

*Hab*.—Cosmopolitan; Australia (introduced).

*Family* DEMODECIDÆ.

A small family consisting of one genus and a few species. The species are all parasitic, the host affected being the human subject, domesticated animals and *Mus musculus*, Linn. The mites lurk in the sebaceous glands and hair follicles; they are small, elongate, with eight three-jointed legs, thorax broad, abdomen tapering, transversely striated above and below, and rounded off at posterior extremity. One species only appears to be known as occurring here. Stringent quarantine laws are responsible for the immunity of our domestic animals.

*Genus* DEMODEX, *Owen.*

DEMODEX FOLLICULORUM, *G. Simon.*

- Demodex folliculorum*, G. Simon, Arach. Anat. Physiol. Med., 1842, pp. 218-237, pl. xi.  
*Acarus folliculorum*, G. Simon, *loc. cit.*  
*Dermodex folliculorum*, Owen, Lect. Invert. Anat., 1843, p. 252.



*Dermodes hominis*, Leydig, Arch. Naturg., xxv., 1859, p. 345, pl. xiii., f. 6.

*Dermodes folliculorum*, var. *hominis*, Mégn., Journ. Anat. et Physiol., xiii., 1877, p. 112.

*Dermodes folliculorum*, var. *hominis*, Raill., Zool., 2nd ed., 1893, p. 634.

*Macrogastrer platypus*, Meischer, Ber. Ges. Basel, v., 1843, p. 191-198.

*Host.*—The human subject.

*Hab.*—Cosmopolitan ; Australia (introduced).

In concluding this Synopsis I desire to express my indebtedness to Mr. S. Johnston, B.Sc., of the Technological Museum, who kindly lent me his collection of microscopic slides of Australian Acarid parasites for reference and study.